INTERRELATIONSHIPS WITH OTHER SUB-ELEMENTS

The General Plan of the City of Sunnyvale is composed of seven elements: Transportation, Community Development, Environmental Management, Public Safety, Socio-Economics, Cultural, and Planning and Management. The Surface Runoff Sub-Element is part of the Environmental Management Element which includes six other sub-elements: Water Resources, Solid Waste Management, Sanitary Sewer system, Energy, Noise and Air Quality.

The goals and policies of the Surface Runoff Sub-Element are directly related and coordinated with those of the Sanitary Sewer and Water Resources Sub-Elements (and will be related and coordinated with the Air Quality Sub-Element when it is prepared), and with two sub-elements of the Community Development Element: Land Use and Seismic Safety and Safety.

The interrelationship of the Surface Runoff Sub-Element with these sub-elements is summarized below.

Environmental Management Element

Sanitary Sewer Sub-Element

Some industrial wastewaters may be treated and discharged directly to storm drains and/or the SCVWD's flood control channels. Direct discharges to storm drains reduce the capacity of the storm drain system to convey rainfall runoff. In the Sanitary Sewer Sub-Element (1983), it is estimated that the maximum quantity of discharge to the storm drains would increase by 250,000 gallons per day when industrial areas are fully developed.

The City has adopted three policy statements in the Sanitary Sewer Sub-Element to control direct industrial process water discharges to storm drains and flood control channels:

1. The discharger must have a permit from the City, an NPDES permit from the Regional Board, permission from the SCVWD, and the discharge water must meet the same standards required for the WPCP effluent.

2. The total volume of process water directly discharged to the storm drain system cannot exceed five percent (5%) of the pipe capacity between the point the process water enters the storm drain system and is discharged to the SCVWD's flood control channels.

3. The City collects applications, annual monitoring data, and special fees to cover all administration costs associated with controlling discharges to storm drains.

Water Resources Sub-Element

The City has three separate sources of water supply: groundwater wells, surface water from the San Francisco Water Department (Hetch-Hetchy), and surface water treated and delivered by the SCVWD. Although the SCVWD manages the groundwater system through groundwater recharge of imported surface water, aquifers are also recharged by rainfall, as well as adjacent groundwater basins and creeks. The greater the permeability of the land surface, the greater the recharge to aquifers during rainfall which reduces rainfall discharged as surface runoff.

Although the City's groundwater wells are located in the southern portion of the City, pollutants in urban runoff discharged upstream of the City may contribute pollutants to City wells.

The Water Resources Sub-Element includes the following statements adopted by the State Water Board and Department of Water Resources:

1. Point sources and nonpoint sources of pollution shall be controlled to protect beneficial uses of water.

2. Instream, beneficial uses shall be maintained, and when practical, restored and enhanced.

3. Methods of preventing property damage or loss of life due to floods must consider flood plain zoning, flood proofing, flood warning systems, and similar nonstructural measures, as well as construction of facilities such as dams, reservoirs and levees.

The Water Resources Sub-Element further states that "the above policies are used as a guide for local agencies to meet the needs of providing water in both quality and quantity for citizens within their jurisdiction" and "local governments are expected to follow the leadership of the state in putting this policy into effect."

Air Quality Sub-Element

Air emissions may be a significant source of pollutants in surface runoff. When the Air Quality Sub-Element is prepared, the goals and policies will be coordinated with the Surface Runoff Sub-Element.

Community Development Element

Land Use Sub-Element

The Land Use Sub-Element sets standards for density of population and intensity of development for land uses and identifies areas subject to flooding. The greater the density of population and development, the greater the surface runoff and the greater the potential for pollutants to be discharged with surface runoff.

Two statements in the Environment section of Goals and Policies in the Land Use Sub-Element directly affect surface runoff:

1. Minimize, where possible, the areas affected by the 100 year flood.

2. The City shall require that the amount of private open space be maintained and when new development occurs the provisioning of private open space shall be enhanced.

Waterways and flood plains are special factors affecting land use location. Santa Clara Valley is essentially an active flood plain. The City participates in the National Flood Insurance Program, administered by the Federal Emergency Management Agency, and several areas along Calabazas Creek, US 101, the Southern Pacific Railroad, areas near the Baylands, and El Camino Real have been identified as being susceptible to a 100 year flood with a depth of approximately 1 foot of water.

Seismic Safety & Safety Sub-Element

The City of Sunnyvale is located in a flood plain between two active faults, the San Andreas and the Hayward faults. Before development disrupted natural depositional processes, the City was the interface between the fluvial deposits of the intermittent streams from the mountains and periodic flooding from the Bay. Consequently, the City is underlain by thick layers of alluvium.

Subsidence caused by excessive ground water extraction has lowered the northern reaches of the City from 6 to 8 feet as described in the Ground Subsidence and Rise in Sea Level section. Many areas are currently below the mean high tide level, a situation which can lead to flooding from both tidal action and the lowered discharge capability of creeks and channels. Although subsidence has been halted by an extensive recharge program, natural subsidence is still occurring and can be intensified by earthquakes.

Heavy rain storms could lead to flooding and without the protective barriers constructed along the margin of the Bay, tidal flooding is also a possibility. Flooding due to earthquake induced subsidence and levee failure are highly probable north of Highway 237 according to the Seismic Safety & Safety Sub-Element.

GOALS, POLICIES AND ACTION STATEMENTS

Introduction

The Surface Runoff Sub-Element of the City of Sunnyvale's General Plan establishes a set of integrated goals, policies, and action statements which guide decision-making to minimize the discharge of pollutants to creeks and South San Francisco Bay and to prevent or minimize flooding.

This sub-element is one of several sub-elements of the General Plan. The goals and policies of this sub-element affect and can be affected by other sub-elements and thus must be integrated with other sub-elements.

Goals, policies and actions statements in this Surface Runoff Sub-Element are based on sound planning principles and basic findings of fact or existing conditions previously outlined in this document. These include the following:

1. Surface waters free from pollution or contamination by surface water runoff are highly desirable to the residents of the City of Sunnyvale, businesses located in the City, and to visitors. The City is committed to maintaining and improving the quality of its surface water runoff to the maximum extent practicable.

2. In order to effectively control the diffuse sources of pollutants characteristic of surface runoff, the active support and participation of the residents and businesses in the City of Sunnyvale are essential. The City is committed to forming a partnership with its residents and businesses to achieve improvements in surface runoff water quality.

3. The City is and will continue to be responsible for the collection, transportation and discharge of rainfall runoff into creeks and channels which will continue to be owned and operated by the SCVWD.

4. The control of pollutants in surface water runoff is a rapidly emerging field with BMPs being developed at the

Nonpoint Source Pollution
and what you can do to help!

federal, state (American Public Works Association's Stormwater Quality Task Force), and local levels (SCV NPS Control Program and/or the Alameda County Urban Runoff Clean Water Program) for the control of pollutants from new construction, industrial and commercial businesses, and municipal maintenance practices. The City will continue to evaluate and implement appropriate BMPs as they continue to be better identified and tested by new studies and practical experience.

5. Federal, state and local regulatory laws and regulations will continue to require that the quality of surface runoff be improved to the maximum extent practicable in order to assure the reasonable protection of beneficial uses of creeks and South San Francisco Bay. The mandated regulatory requirements for compliance imposed on the City will continue to be spelled out in its areawide municipal storm water NPDES permit and subsequent amendments and re-issuances of this permit. This permit was originally adopted by the Regional Board in June 1990 and was amended in February 1992.

6. The implementation of the activities required by the areawide municipal storm water NPDES permit is being and will continue to be achieved by incorporating additional functions onto existing City programs. For example, the industrial pretreatment program will also implement the storm water surface runoff program for these facilities.

7. The City has an ordinance which prohibits the discharge of any sanitary sewage, waste or wastewater into any storm drain or natural outlet or channel. The SCV NPS Control Program has developed a model Storm Water Pollution Control ordinance and a sample ordinance. The City is committed to assuring the adequate expression of its legal authority to effectively implement controls on pollutants in surface water runoff.

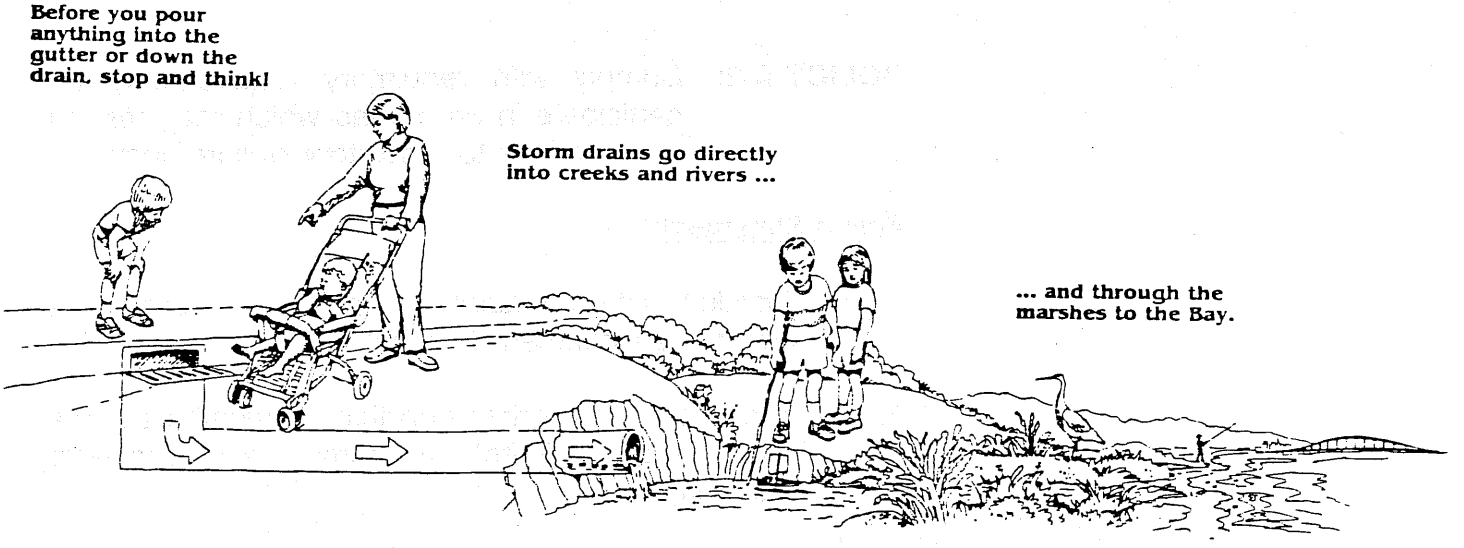
8. The City may consider implementing a storm water fee as a component of its sanitary sewerage revenues to fund the additional activities required by the City's areawide municipal storm water NPDES permit.

9. Natural subsidence of alluvium, earthquakes, and global warming may increase the relative mean sea level of San Francisco Bay which may cause flooding of areas near San Francisco Bay.

Goals

Surface runoff goals are organized under five headings:

1. PROTECT BENEFICIAL USES OF CREEKS AND SAN FRANCISCO BAY (GOAL A)
2. MAINTAIN STORM DRAIN SYSTEM (GOAL B)
3. RECOGNIZE FLOOD HAZARDS (GOAL C)
4. MINIMIZE POLLUTANTS AND RUNOFF FROM NEW DEVELOPMENTS (GOAL D)
5. FUNDING (GOAL E)



GOAL A: ASSURE THE REASONABLE PROTECTION OF BENEFICIAL USES OF CREEKS AND SAN FRANCISCO BAY, ESTABLISHED IN THE REGIONAL BOARD'S BASIN PLAN, AND PROTECT ENVIRONMENTALLY SENSITIVE AREAS.

POLICY A.1: Continue to support the identification and development of BMPs suitable for use in the City through participation in the SCV NPS Control Program, American Public Works Association's Stormwater Quality Task Force, the Bay Area Stormwater Management Agencies Association, and similar organizations.

POLICY A.2: Comply with regulatory requirements and participate in processes which may result in modifications to regulatory requirements.

Action Statements:

A.2.a. Conduct internal audits in order to continue to improve environmental programs.

A.2.b. Implement appropriate pollution prevention activities for targeted pollutants to comply with regulatory requirements.

A.2.c. Review proposed changes in regulatory requirements and comment as appropriate.

A.2.d. When evaluating pollutant control measures, consider all potential impacts including effects on the storm drain system, sanitary sewer system, and groundwater.

POLICY A.3: Ensure that BMPs are implemented to reduce the discharge of pollutants in storm water to the maximum extent practicable.

Action Statements:

A.3.a Inspect industrial and commercial businesses for potential discharges to storm drains as part of industrial pretreatment inspections for the WPCP.

A.3.b Modify Industrial Pretreatment permits to also require BMPs to control the discharge of pollutants to city-owned storm drains.

A.3.c Use the City newsletter and utility billings to disseminate information regarding the proper disposal of waste and to encourage the public to participate in reducing pollutants in storm water runoff.

A.3.d Continue outreach programs to industrial and commercial businesses to educate them on proper disposal of waste to the sanitary sewer and storm drains.

A.3.e Label approximately 1060 municipal storm drainage inlets a year until all inlets are labelled and maintain labels as necessary to educate the public on the fate of material discharged to storm drains.

A.3.f Encourage private property owners to label storm drain inlets.

A.3.g Conduct surveys during public events to track public awareness of the SCV NPS Control Program.

A.3.h Obtain copies and use the Statewide Best Management Practices Manual (to be available around the beginning of 1993) as guidance.

A.3.i Modify new development and re-development permitting procedures to require developers and contractors to implement BMPs before, during, and after construction to minimize pollutants discharged in storm water runoff. The report titled "Storm Water

Quality Controls for New Developments in Santa Clara Valley and Alameda County: A Guide for Controlling Post-Development Runoff" will be used as guidance to achieve post-development controls.

A.3.j Continue to participate with the SCV NPS Control Program to hold workshops to notify developers, consulting firms, and contractors of the General Construction Activity Storm Water Permit; to notify industries of industrial NPDES storm water permit requirements and everyone about the requirements of the City's area-wide municipal storm water NPDES permit.

A.3.k Continue to develop and maintain accurate maps of the storm drain system owned and operated by the City.

A.3.l Track existing municipal government activities which remove pollutants prior to discharge to storm drains such as the number of storm drain inlets cleaned, curb miles swept, and amounts of material removed.

A.3.m In addition to sweeping streets for aesthetic purposes, sweep to prevent pollutants from entering storm drain inlets. Similarly, in addition to cleaning storm drain inlets to prevent flooding, clean inlets to remove pollutants from the storm drain system. The "BMPs for Street Cleaning and Storm Drainage Facilities" developed by the Alameda County Urban Runoff Clean Water Program may be used as guidance.

A.3.n Track creek and South San Francisco Bay water quality data collected by the SCV NPS Control Program, WPCP and other environmental monitoring programs, for changes resulting from the implementation of BMPs.

A.3.o Continue to detain storm water runoff in the Pump Station No.2 basin to settle sediment and associated pollutants prior to discharge to receiving waters.

A.3.p Monitor influent and effluent from the basin to determine percent removal of pollutants in order to

evaluate the effectiveness of the detention basin in removing pollutants.

A.3.q Test pollutants in the basins, and develop and implement a maintenance plan to assure that sediment is periodically removed and properly disposed.

POLICY A.4: Effectively prohibit illicit discharges and improper disposal into the storm drain system.

Action Statements:

A.4.a Encourage all residents, industrial and commercial facilities, and public agencies to report spills and illegal dumping incidents to the WPCP in order to initiate an immediate response and log spills.

A.4.b. Perform tests and inspections to discover unauthorized discharges into storm drains.

A.4.c Track reports of spill incidents received at the WPCP.

A.4.d Locate and eliminate illicit connections.

A.4.e Consider possible improvements to ordinances to more clearly spell out the requirements for implementing BMPs and for providing the authority to request monitoring or technical reports that might be necessary from dischargers to the City's storm drainage system.

POLICY A.5: Prevent accelerated soil erosion

Action Statements:

A.5.a Require developers and contractors to implement Association of Bay Area Governments (ABAG) soil erosion control measures.

A.5.b Encourage property owners to maintain vegetative cover.

GOAL B: MAINTAIN STORM DRAIN SYSTEM TO PREVENT FLOODING

POLICY B.1: Maintain and operate the storm drain system so that storm waters are drained from 95 % of the streets within one hour after a storm stops.

Action Statements:

B.1.a Inspect and clean as necessary all storm drainage inlets at least once a year prior to the rainy season.

B.1.b Clean drop inlets in response to flood complaints.

B.1.c When cleaning storm drain inlets and lines, maximize removal of material at the nearest access point to minimize discharges to watercourses.

B.1.d Inspect storm water pump stations weekly and maintain as needed.

B.1.e Assure proper disposal of all material cleaned from storm drain inlets and lines.

POLICY B.2: Respond to storm drain emergencies.

Action Statements:

B.2.a Respond to all emergency calls within 20 minutes during storms and within 45 minutes during other periods.

B.2.b Inspect and eliminate unauthorized discharges into the storm drain system.

GOAL C: ENSURE THAT FLOOD HAZARDS ARE RECOGNIZED.

POLICY C.1: Operate and maintain the City's storm drainage system at a level to minimize damages and ensure public safety.

Action Statement:

C.1.a Update maps of the storm drain system after new developments and/or redevelopments and storm drainage additions.

C.1.b Maintain records of incidents of local flooding and budget for system improvements.

POLICY C.2: Prevent flooding to protect life and property.

Action Statements: (primarily from the Seismic Safety & Safety Sub-Element)

C.2.a Encourage the SCVWD to periodically reevaluate the capacity of creeks and channels.

C.2.b Encourage the SCVWD to maintain creeks and channels to remove flow-inhibiting vegetation, debris and silt.

C.2.c Encourage the SCVWD to maintain dikes and levees at least 3 feet above the 1% flood level and to inspect and repair damage caused by burrowing animals.

C.2.d Continue to maintain the flood plain management practices outlined by the Federal Emergency Management Agency (FEMA) and the Army Corps of Engineers.

C.2.e Continue participation in the National Flood Insurance Program.

POLICY C.3: Monitor and plan for hydraulic changes due to global warming, earthquakes and/or subsidence.

Action Statements:

C.3.a Track sea level elevations at tide gauge locations maintained by the US Coast Guard, National Oceanic and Atmospheric Administration, and the San Francisco Bay Conservation and Development Commission to monitor changes in sea level.

C.3.b Monitor compaction, water level, and land surface elevation data compiled by the SCVWD for possible land subsidence.

C.3.c Encourage the SCVWD to consider installing tide gates in channels and creeks to prevent flooding during high tides.

C.3.d Budget for and construct additional storm drainage detention and pumping facilities as needed to assure continued ability to discharge surface runoff into the various SCVWD facilities and San Francisco Bay.

C.3.e When designing structures along shorelines, consider future sea level changes.

C.3.f Ensure that private developers adequately plan and construct buildings to protect property in low lying areas.

C.3.g. Review FEMA maps when they are updated every 3-5 years, and incorporate information on flood prone areas into future land use plans.

GOAL D: MINIMIZE THE QUANTITY OF RUNOFF AND DISCHARGE OF POLLUTANTS TO THE MAXIMUM EXTENT PRACTICABLE BY INTEGRATING SURFACE RUNOFF CONTROLS INTO NEW DEVELOPMENT AND REDEVELOPMENT LAND USE DECISIONS.

POLICY D.1: Consider the impacts on the water quality of surface runoff as part of land use and development decisions and implement BMPs to minimize the total volume and rate of runoff.

Action Statements:

D.1.a Study and determine the appropriateness of a particular parcel of land to support selected BMP(s) for removing pollutants prior to discharge.

D.1.b Assure that all applicable development projects (those disturbing 5 acres or greater of land) obtain coverage under the State Water Board's general construction activity storm water NPDES permit or under a similar Regional Board permit if one is adopted in the future.

D.1.c Assure that a reference list of BMPs and copies of appropriate BMP manuals and/or guidelines are available at City libraries and City offices.

POLICY D.2: Consider the ability of a land parcel to detain excess storm water runoff in flood prone areas and require incorporation of appropriate controls.

Action Statement:

D.2.a Land use decisions should also consider the ability of a parcel to detain excess storm water in areas prone to flooding through use of oversized collection systems and detention facilities.

GOAL E: CONSIDER ALTERNATIVE METHODS OF GENERATING REVENUE TO SUPPORT THE CITY'S SURFACE RUNOFF QUALITY IMPROVEMENT ACTIVITIES.

POLICY E.1: Develop a revenue program that will ensure funding to: 1) implement BMPs; 2) conduct public information and participation outreach activities; 3) inspect and eliminate illicit discharges, and inspect industrial and commercial facilities; 4) meet storm drain operational and maintenance needs to improve surface runoff quality; 5) monitor storm water quality; 6) participate in general SCV NPS Control Program activities; and 7) provide appropriate reserves.

Action Statements:

E.1.a Evaluate the ability of the existing sanitary sewerage revenue program to provide adequate support for the City to comply with activities mandated by the areawide municipal storm water NPDES permit and with the other surface runoff control activities included in the SCV NPS Control Program.

E.1.b Review the rate structure annually and consider appropriate changes.

UPDATING OF THE SURFACE RUNOFF SUB-ELEMENT

Periodic updating of information contained in the Surface Runoff Sub-Element provides the opportunity to identify current data and emerging trends, as well as to measure success towards completing surface runoff goals. An annual update should include reviewing the data contained in the Sub-Element and the progress of achieving established goals and policies through the implementation of action statements. This annual review will be included as a segment of the year-end report to the SCVWD on the activities and accomplishments of the Department of Public Works. Every five years, the City should review this Sub-Element to determine whether it needs to be updated to include the most recently mandated regulatory requirements imposed on the City, changes in the status of knowledge about effective BMPs, and any current studies of trends.

APPENDIX A

List of References

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APPENDIX B

Watershed Hydrology

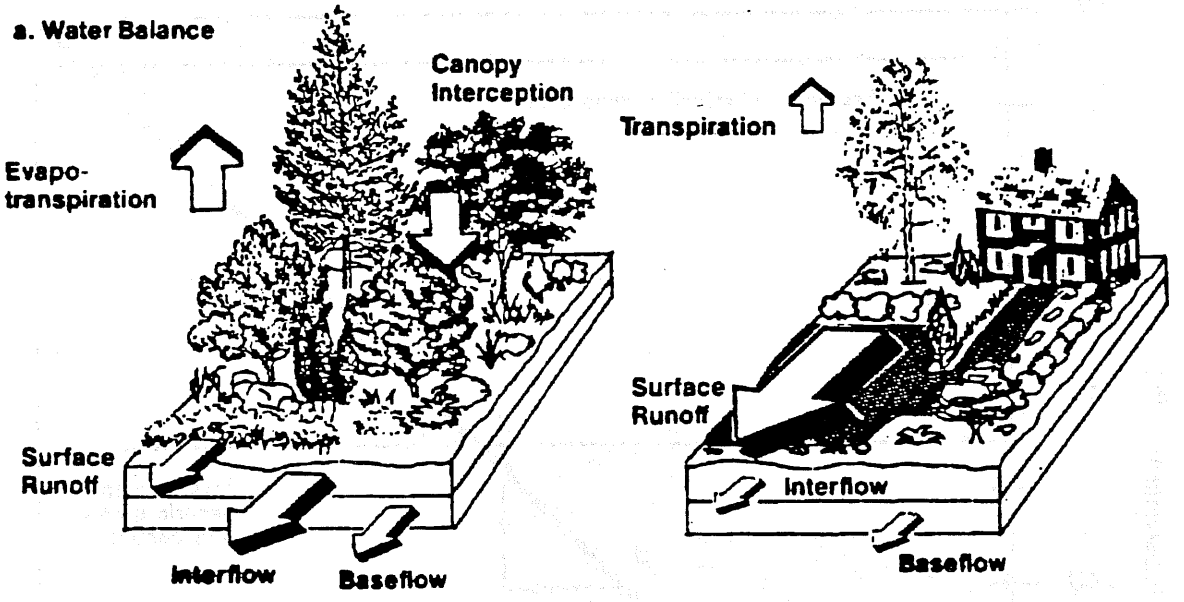
Storm Water Pollution Control Techniques

Structural Controls

WATERSHED HYDROLOGY

FIGURE B1

CHANGES IN STREAM FLOW AS A RESULT OF URBANIZATION



Source: Schueler (1987)

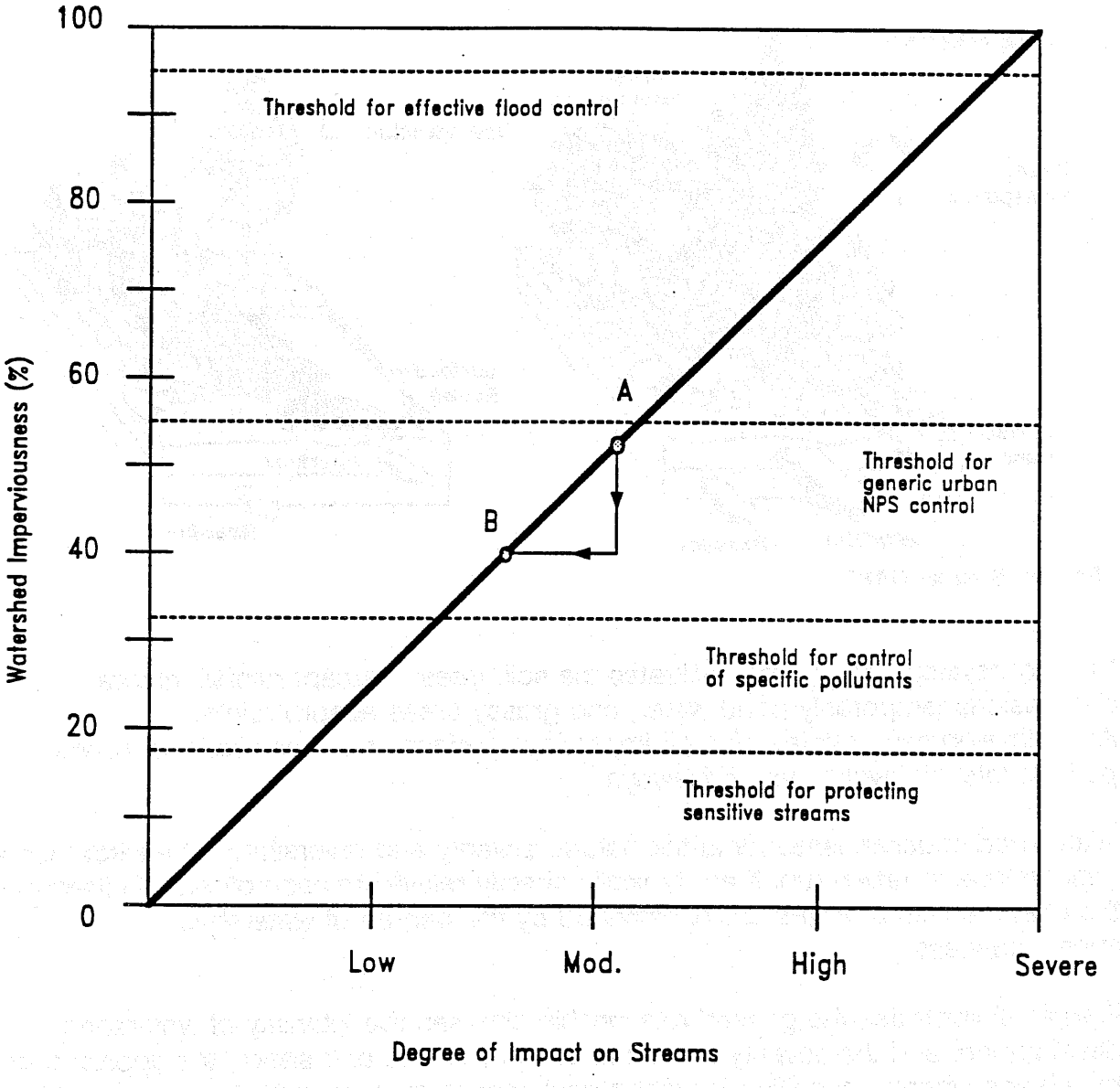
Prior to development, rainfall infiltrates the soil, trees intercept rainfall, natural depressions temporarily pond water, and grassy areas absorb rainfall. After development, rainfall runs off impervious surfaces such as rooftops, roads, parking lots, sidewalks, and driveways.

Watershed imperviousness and the nature, severity and reversibility of environmental impacts due to urban runoff are typically directly related to each other. Furthermore, the effectiveness of BMPs are constrained by the degree of watershed imperviousness.

Figure B2 illustrates the general relationship between the intensity of watershed development and the severity of the impact on streams and shows the approximate thresholds where a specific watershed goal cannot be achieved. For example, when the watershed is approximately fifteen to twenty percent impervious, the impact on streams is still relatively low but protecting sensitive streams becomes very difficult. When the watershed is approximately ninety to one hundred percent impervious, the impact on streams is severe and the threshold for effective flood control is exceeded.

FIGURE B2

RELATIONSHIP BETWEEN WATERSHED IMPERVIOUSNESS, STREAM IMPACTS, AND TARGET THRESHOLDS



Source: Schueler (1990)

STORM WATER POLLUTION CONTROL TECHNIQUES

There are a range of possible storm water pollution control techniques which can be categorized into the following:

No Control is the "do nothing" alternative. Storm water pollution techniques may not be possible in intensively developed storm drain networks that discharge directly to a large receiving water.

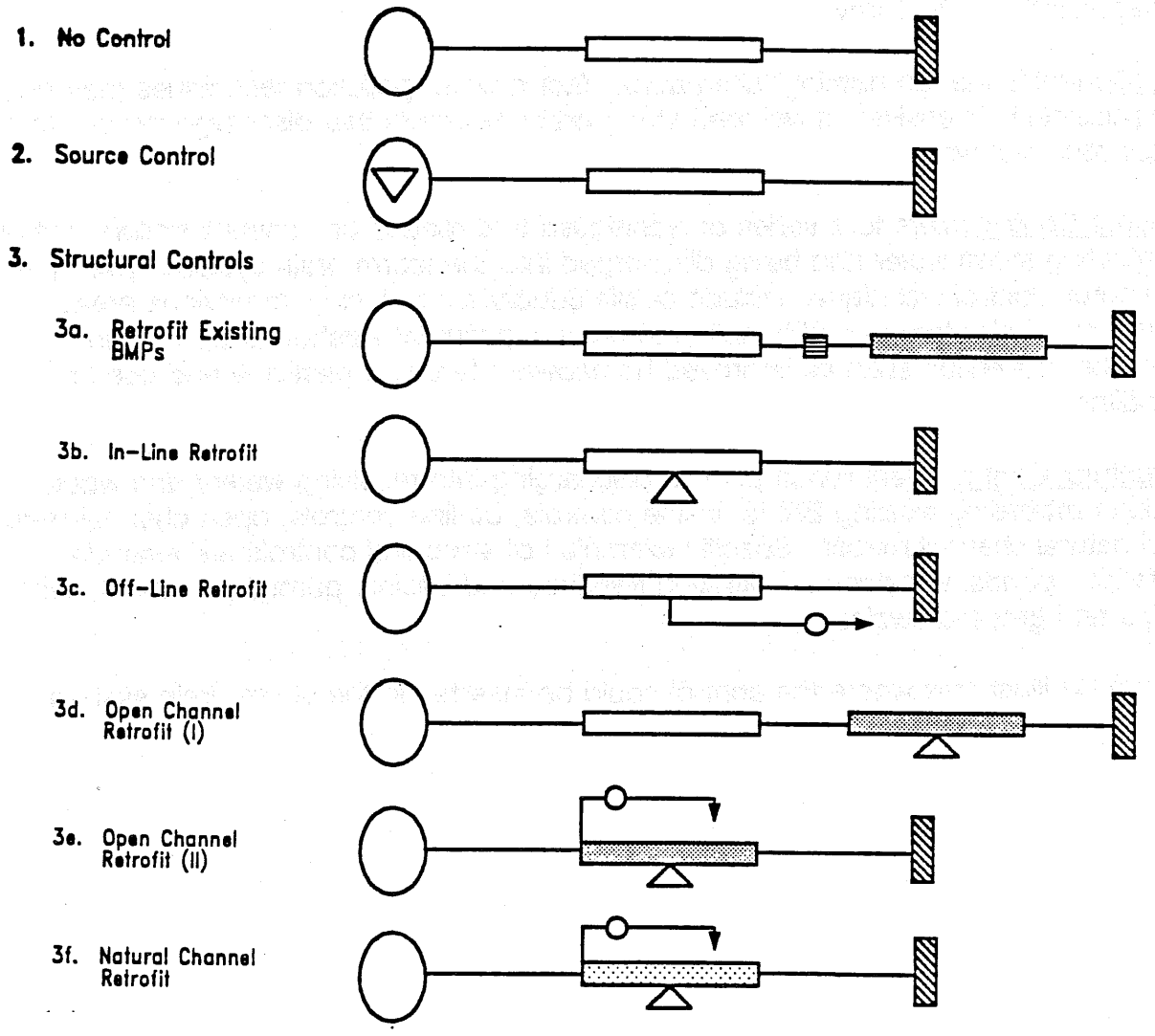
Source Control refers to a series of techniques that reduce or eliminate pollutants from contacting storm water and being discharged into the storm drain system. Examples of source control techniques include public education; reducing impervious areas; better materials storage and handling to prevent pollutant washoff or spills; and pollution prevention such as improved homeowner fertilizer, pesticide and used oil handling.

Structural Controls treat runoff prior to discharging into receiving waters and would include retrofitting existing BMPs, in-line controls, off-line controls, open channel retrofit and natural channel retrofit. Specific examples of structural controls are extended detention ponds, wet ponds, infiltration trenches and basins, porous pavement, filter strips and grassed swales.

Figure B3 illustrates where the control could be inserted in the storm drain system.

FIGURE B3

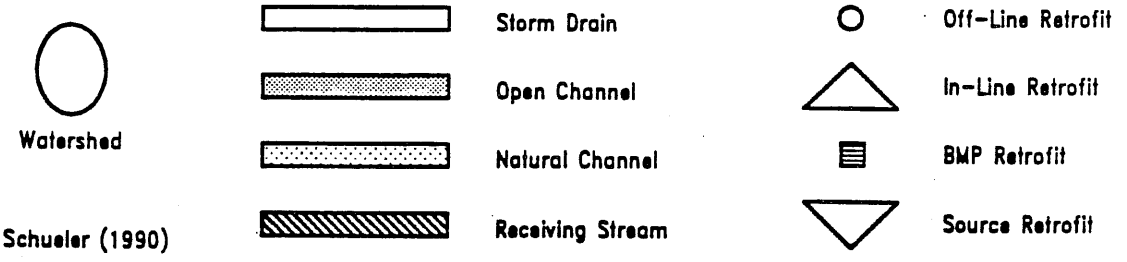
URBAN STORM WATER CONTROL TECHNIQUES



2 through 3c City of Sunnyvale jurisdiction

3d through 3f SCVWD jurisdiction

KEY:



Source: Schueler (1990)

STRUCTURAL CONTROLS

The following figures compare different aspects of structural controls:

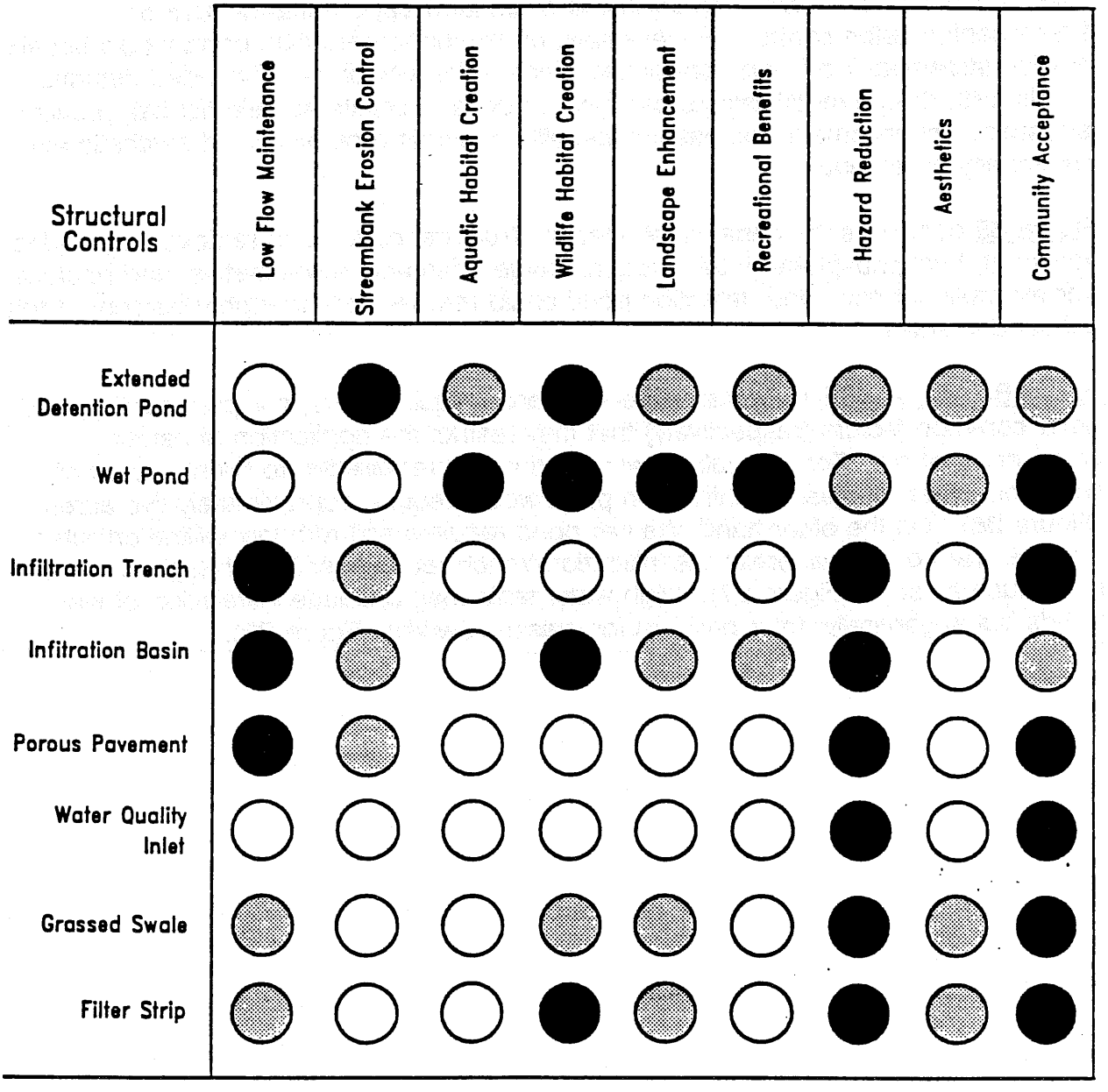
Figure B4 summarizes whether a specific structural control provides certain environmental or community amenities, such as landscape enhancement or streambank erosion control. For example, an extended detention pond would usually provide streambank erosion control and create wildlife habitats. Extended detention ponds, with design modifications can also be used to create aquatic habitat, provide landscape enhancement, recreational benefits, hazards reduction, and aesthetic and community acceptance.

Figure B5 compares the capacity of specific structural controls to remove suspended sediment, total phosphate, total nitrogen, oxygen demand, trace metals, and bacteria. For example, an extended detention pond could remove sixty to eighty percent of total suspended solids.

Figure B6, B7, and B8 illustrates watershed area requirements, soil permeability, and other common factors (respectively) that may restrict the application of certain structural controls. For example, a wet pond would require ten to twenty acres of watershed area whereas an infiltration pond would require approximately five acres (Figure B6). On the other hand, the wet pond requires soil with low infiltration rates such as loam or clay whereas the infiltration trench requires soils with high infiltration rates such as sand (Figure B7). High water table may preclude installation of wet ponds but is generally not a problem for grassed swales (Figure B8).

FIGURE B4

ENVIRONMENTAL AND COMMUNITY AMENITIES PROVIDED BY STRUCTURAL CONTROLS



Source: Schueler (1987)

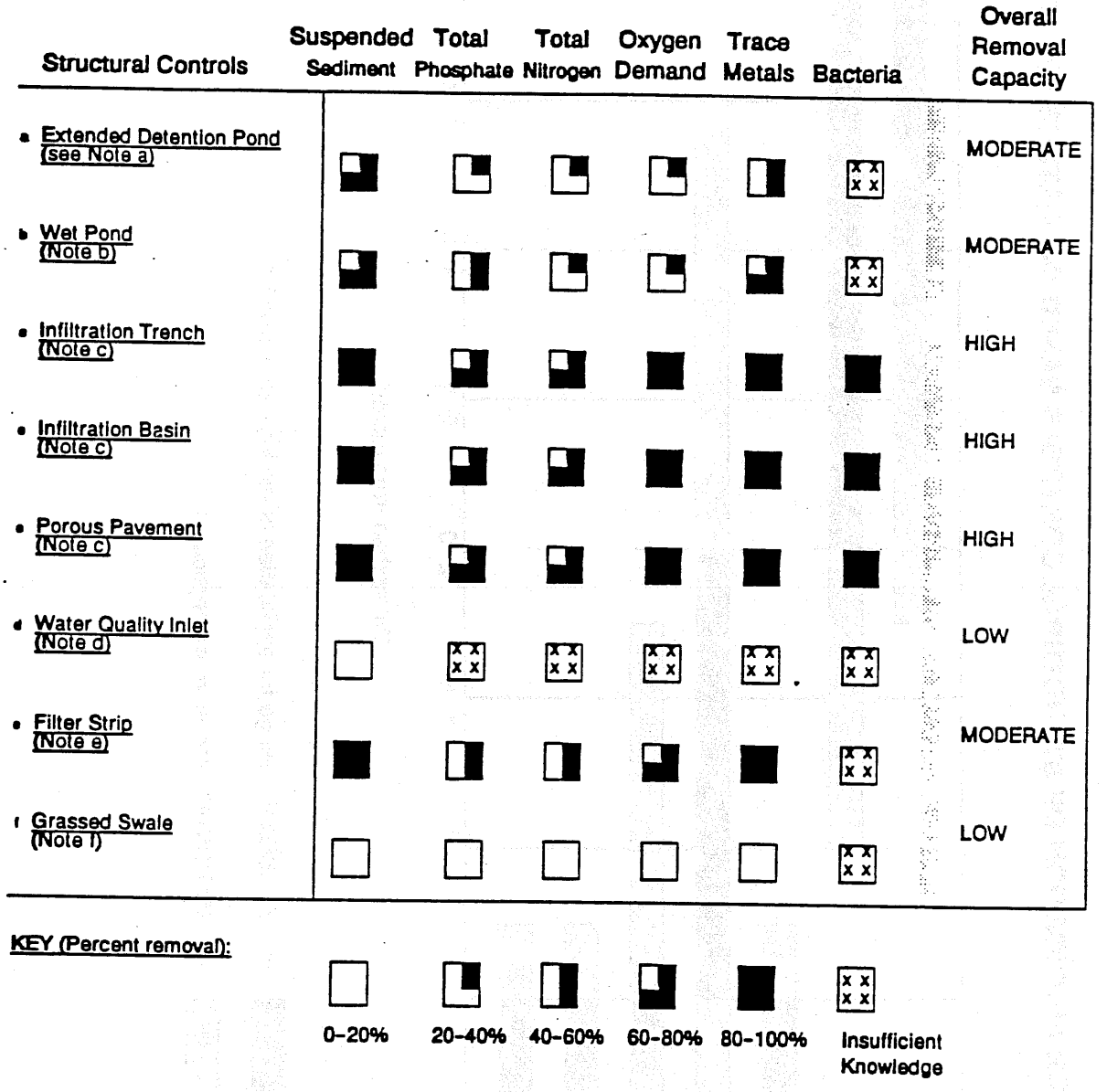
Seldom Provided

Sometimes Provided (w/ Design Modifications)

Usually Provided

FIGURE B5

COMPARATIVE POLLUTANT REMOVAL OF STRUCTURAL CONTROLS



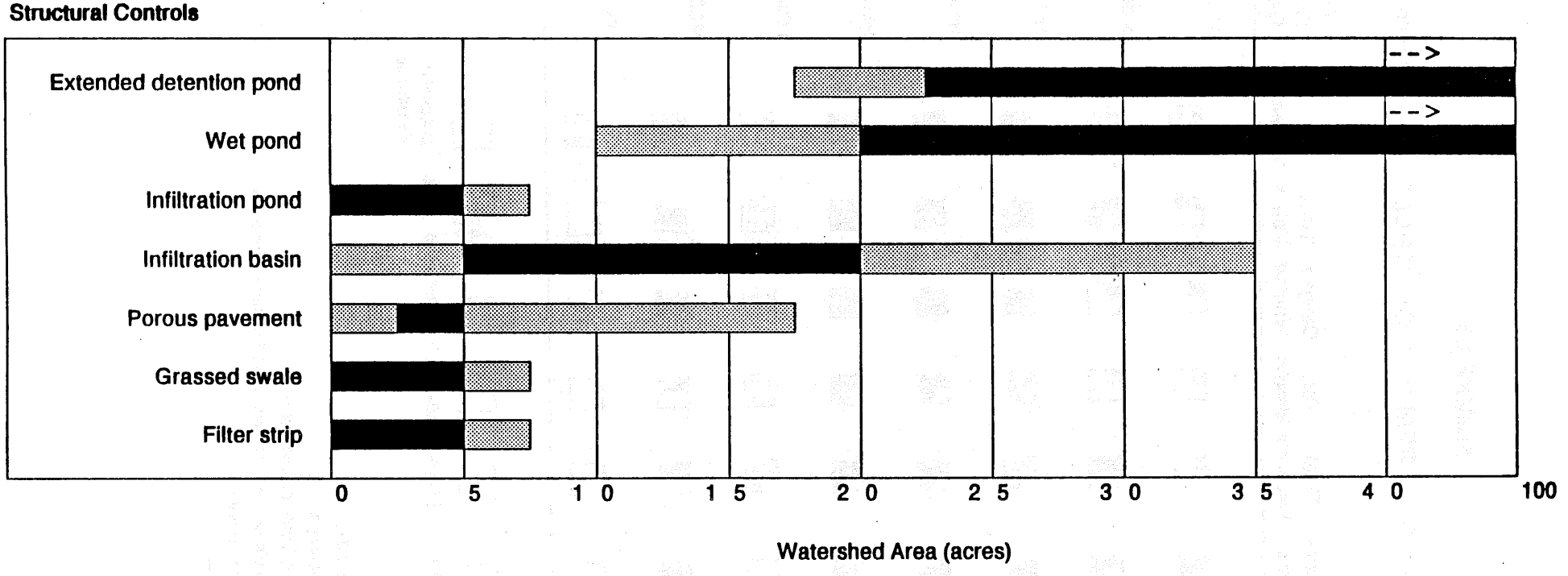
NOTES:

- a First-flush runoff volume detained for 6-12 hours.
- b Permanent pool equal to 2.5 mean storm runoff.
- c Facility exfiltrates all runoff, up to the 2 year design storm.
- d 400 cubic feet wet storage per impervious acre; see Figure 2-2 for illustration of inlet.
- e 100 foot wide forested strip, with level spreader.
- f High slope swales without check dams.

Source: Schueler (1987)

FIGURE B6

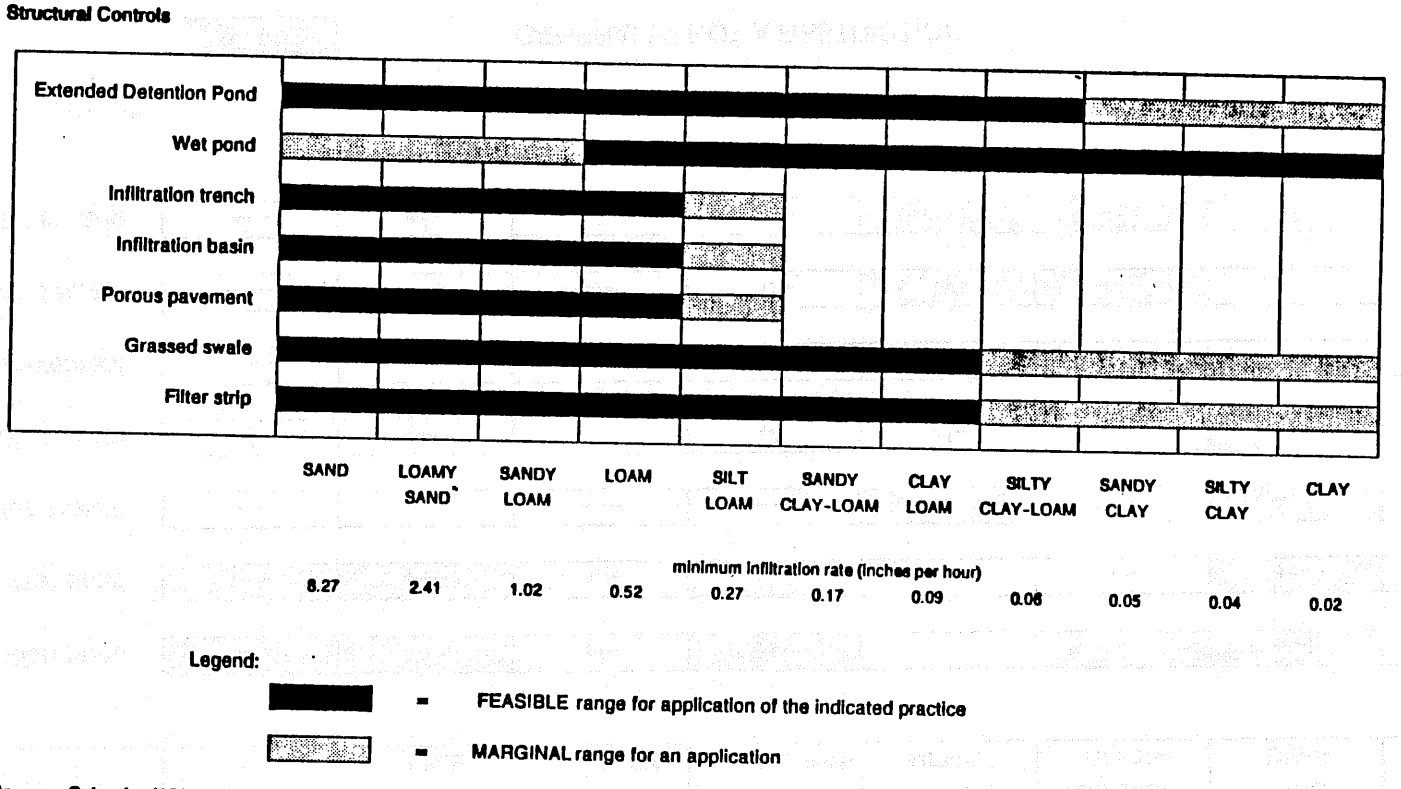
RESTRICTIONS FOR APPLICATION OF STRUCTURAL CONTROLS BASED ON WATERSHED AREA



Source: Schueler (1987)

FIGURE B7

RESTRICTIONS FOR APPLICATION OF STRUCTURAL CONTROLS BASED ON SOIL PERMEABILITY



Source: Schueler (1987)

FIGURE B8

OTHER COMMON RESTRICTIONS FOR STRUCTURAL CONTROLS

Structural Control	SLOPE	HIGH WATER TABLE	CLOSE TO BEDROCK	NEAR TO FOUNDATIONS	SPACE REQUIRE-MENTS	MAXIMUM DEPTH	RESTRICT LAND USES	HIGH SEDIMENT INPUT
Extended Detention pond	+++	+++	+/-	+++	---	+++	+++	+/-
Wet pond	+++	+++	+/-	+++	---	---	+++	+/-
Infiltration trench	---	---	---	---	+++	---	+++	---
Infiltration basin	+/-	---	---	+/-	+/-	---	+++	---
Porous pavement	---	---	---	---	---	---	---	---
Grassed swale	---	---	+/-	+/-	+++	+++	---	---
Filter strip	+/-	+/-	+/-	+/-	+++	+++	+/-	---

Legend:

+++	=	GENERALLY NOT A RESTRICTION
+/-	=	CAN BE OVERCOME WITH CAREFUL DESIGN
---	=	MAY PRECLUDE USE OF THE BMP

Source: Schueler (1987)

APPENDIX C

Background Monitoring Data

BACKGROUND MONITORING INFORMATION
(Station Locations Illustrated in Figure C1)

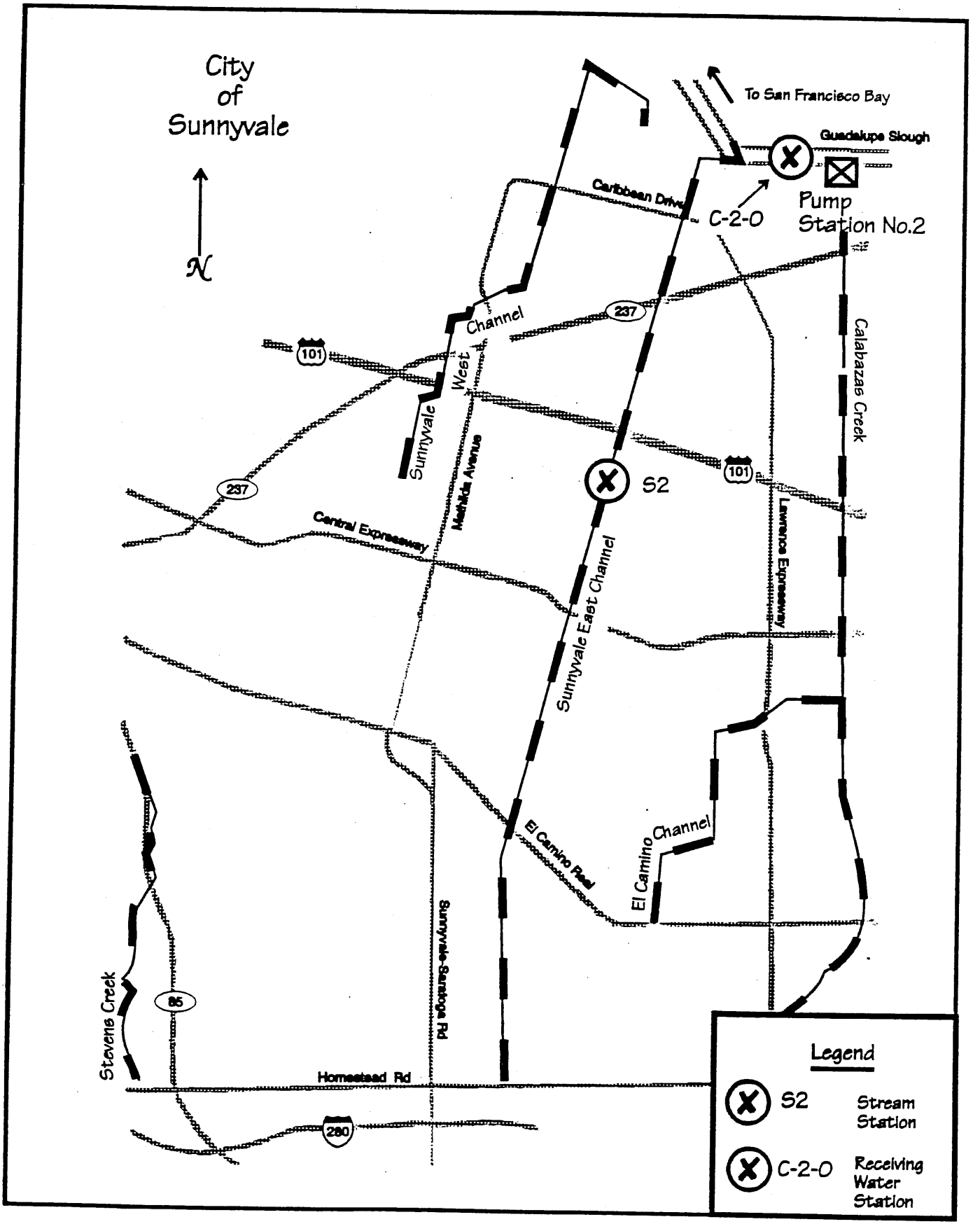
	FY 88/89	FY 89/90	FY 90/91	FY 91/92
1. Total Metals Concentrations (μg/L)				
Cadmium:				
East Channel, S2	1.7	1	0.6	*
Pump Station No.2 Inlet	N/A	N/A	0.4	*
Pump Station No.2 Outlet	N/A	N/A	0.2	*
Guadalupe Slough (C-2-0)	N/A	0.05	0.09	N/A
Chromium:				
East Channel, S2	25	22	24	*
Pump Station No.2 Inlet	N/A	N/A	3.6	*
Pump Station No.2 Outlet	N/A	N/A	2.7	*
Guadalupe Slough (C-2-0)	N/A	0.7	0.2	N/A
Copper:				
East Channel, S2	42	38	38	*
Pump Station No.2 Inlet	N/A	N/A	8.7	*
Pump Station No.2 Outlet	N/A	N/A	6.8	*
Guadalupe Slough (C-2-0)	N/A	4.2	3.6	N/A
Lead:				
East Channel, S2	39	38	51	*
Pump Station No.2 Inlet	N/A	N/A	6.4	*
Pump Station No.2 Outlet	N/A	N/A	3.4	*
Guadalupe Slough (C-2-0)	N/A	1.2	2.1	N/A
Nickel:				
East Channel, S2	32	26	36	*
Pump Station No.2 Inlet	N/A	N/A	1.7	*
Pump Station No.2 Outlet	N/A	N/A	1.7	*
Guadalupe Slough (C-2-0)	N/A	9.2	7.7	N/A
Zinc:				
East Channel	287	225	166	*
Pump Station No.2 Inlet	N/A	N/A	46	*
Pump Station No.2 Outlet	N/A	N/A	26	*
Guadalupe Slough (C-2-0)	N/A	22	21	N/A

BACKGROUND MONITORING INFORMATION
(Station Locations Illustrated in Figure C1)

	FY 88/89	FY 89/90	FY 90/91	FY 91/92
2. Total Suspended Solids Concentration (mg/L)				
East Channel, S2	143	105	242	*
Pump Station No.2 Inlet	N/A	N/A	12	*
Pump Station No.2 Outlet	N/A	N/A	7.3	*
Guadalupe Slough (C-2-0)	N/A	47	32	N/A

FIGURE C1

MONITORING STATION LOCATIONS



APPENDIX D

Possible Control Measures

Table 6-2A: Recommended Educational Control Measures

	POTENTIAL CONTROL MEASURES	Principal Functions			Geographic Applicability	
		Source Control	Hydraulic Control	Treatment Control	Area-Wide	Community* Specific
	EDUCATIONAL CONTROLS					
E1	Educate re: the impacts that result when oil, antifreeze, pesticides, herbicides, paints, solvents, or other potentially harmful chemicals are dumped into storm sewers or drainage channels.	•			•	
E2	Educate re: the proper use (e.g., application methods, frequencies, and precautions) and proper management of fertilizers, pesticides, herbicides, and other potentially harmful chemicals.	•			•	
E3	Educate re: the effective use of "housekeeping" practices, including the use of absorbents, cleaning compounds, and oil/grease traps for controlling oil and grease in gas stations, automotive repair shops, parking areas, commercial/industrial facilities, and food service facilities.	•			•	
E4	Educate re: the NPS pollution impacts that result from littering and improper solid waste practices.	•			•	
E5	Educate re: the need to keep rainfall and runoff from contacting potential contaminants. Describe typical examples of the problem and practical solutions.	•			•	
E6	Educate re: the need to minimize both the total volume of runoff and the peak rate of runoff from a given area. Describe basic principles and suggest alternative practical means to enhance surface retention and infiltration.	•			•	
E7	Educate re: the relationship between air pollution and NPS water quality problems. Coordinate with and obtain information from BAAQMD, CARB, and ABAG.	•			•	
E8	Educate re: the need to intensify vehicle inspection and maintain efforts to reduce leakage of oil, antifreeze, hydraulic fluid, etc.	•			•	
E9	Educate re: the environmental impacts which result from leaks and spills from gasoline, fuel oil, and chemical tanks (above and below ground).	•			•	
E10	Educate architects, engineers, contractors, and public works personnel, about the need for and practical methods for erosion control, sediment control, groundwater disposal, and site waste disposal.	•			•	
E11	Educate farmers, ranchers, and other managers of agricultural and/or open-space lands re: the need for and practical methods for erosion control and sediment control.	•			•	
E12	Educate managers and users of park lands and open-space lands re: the need to restrict off-trail activities. Establish and enforce practical, site-specific regulations to control off-trail activities.	•			•	
E13	Educate re: the need to clean up and properly dispose of pet wastes.	•			•	
E14	Educate re: the need to cooperate with programs (by others) which seek to reduce particulate atmospheric emissions of pollutants from individual, public, commercial, and industrial sources.	•			•	
E15	Educate re: the need to cooperate with programs (by others) which seek to reduce automobile use by various means (e.g., ride sharing, carpooling, public transportation).	•			•	
E16	Educate re: the need to intensfiy vehicle inspection and maintenance efforts to reduce atmospheric emissions.	•			•	
E17	Educate re: the need to minimize the total runoff volume that roof drains contribute directly to storm sewers and drainage channels. Describe basic principles and suggest practical alternatives to minimize their peak rate of discharge.	•			•	

* Community specific controls will be selected for implementation by individual communities on the basis of cost, benefit, and suitability. Not every measure will be implemented by every city.

Table 6-2B: Recommended Regulatory Control Measures

		Principal Functions			Geographic Applicability	
	POTENTIAL CONTROL MEASURES	Source Control	Hydraulic Control	Treatment Control	Area-Wide	Community* Specific
	REGULATORY CONTROLS					
R1	Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to control littering and the improper disposal of potentially harmful wastes.	•			•	
R2	Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to prevent the improper disposal of soil, debris, refuse, or other pollutants into storm sewers and drainage channels.	•			•	
R3	Research, strengthen (if necessary), and enforce existing regulations which give local jurisdictions the legal authority to eliminate cross-connections, which allow sanitary sewage and/or commercial/industrial wastewater to enter storm sewers or drainage channels.	•			•	
R4	Develop and implement effective erosion and sediment control regulations, and requirements for corresponding construction inspection programs. These should apply to public-sector as well as private-sector construction programs.	•			•	
R5	Research, strengthen (if necessary), implement, and enforce regulations which will give local jurisdictions the legal authority to require site drainage designs and systems which minimize the total volume of runoff and the peak rate of runoff from new construction, where local conditions permit.		•		•	
R6	Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the authority to require oil and grease controls in areas which are significant sources (e.g., gas stations, automotive shops, wrecking yards, machine shops, commercial/industrial facilities, parking areas and food service establishments).	•			•	
R7	Require new commercial, industrial, institutional, and major multi-family residential building complexes to have drainage facilities that incorporate on-site retention and/or infiltration -- to assure that neither the total volume of runoff nor the peak rate of runoff exceed pre-project conditions.		•		•	
R8	Require new public and private sector developments to make significant use of permeable surfaces in new landscaping, recreation areas, walkways, and parking areas to maximize infiltration (e.g., bark, gravel, other groundcover, brick, cobblestones, porous pavement). Use planted areas and/or grassy swales,where appropriate, to maximize retention and infiltration.		•		•	
R9	Coordinate with the RWQCB to be sure that potential water quality impacts are adequately considered at the time NPDES permits are issued for any discharges to storm sewers or drainage channels. Include monitoring of all pertinent constituents as a permit stipulation.	•			•	
R10	Develop and implement improved erosion and sediment control policies in the environmental elements of all General Plans (develop and adopt General Plan Amendments, where needed).	•			•	
R11	Adopt policies which require all CEQA compliance documents and site drainage designs to explicitly address the following: erosion potential, proposed erosion and sediment control plans, proposed inspection programs, related environmental impacts, and enforceable mitigation measures to minimize environmental impacts.	•			•	
R12	Develop and implement regulations which require landowners and/or tenants to provide covers (e.g., roofs, tarps) to keep rain off of areas which contain contaminants (e.g.,chemical storage areas, waste storage areas, contaminated industrial areas); and to keep runoff from draining through areas which contain contaminants.	•			•	
R13	Coordinate with efforts (by others) to intensify the implementation of existing regulations which call for improved designs of new tanks (e.g., double walls, monitoring facilities); an aggressive self-monitoring program to be conducted by landowners and tenants; and a strategically focused spot-check program to search for, identify, test, and control leaking storage tanks.	•				

* Community specific controls will be selected for implementation by individual communities on the basis of cost, benefit, and suitability. Not every measure will be implemented by every city.

Table 6-2C: Recommended Public Agency Control Measures

	POTENTIAL CONTROL MEASURES	Principal Functions			Geographic Applicability	
		Source Control	Hydraulic Control	Treatment Control	Area-Wide	Community* Specific
	PUBLIC AGENCY CONTROLS					
P1	Label storm drain inlets and provide signs along the banks of drainage channels and creeks explaining the environmental impacts of dumping wastes.	•			•	
P2	Develop and implement programs which provide convenient means for people to properly dispose of oil, antifreeze, pesticides, herbicides, paints, solvents, and other potentially harmful chemicals (recycle if possible).	•			•	
P3	Develop and implement an aggressive field program to search for, detect, and prevent dumping or routinely discharging pollutants into storm sewers and drainage channels. This may involve re-evaluating previous decisions which allowed certain relatively clean waters to be discharged to the stormwater systems.	•			•	
P4	Develop and implement an agressive field program to search for, detect, and control illicit connections of sewers which carry sanitary and/or commercial/industrial wastewater.	•			•	
P5	Determine the effectiveness of increasing the frequency of cleaning out storm sewer inlets, catchbasins, storm sewers, and drainage channels in areas where sediments and/or debris tend to accumulate. Develop and implement improved programs where appropriate.	•			•	
P6	Develop and implement an aggresive field program to search for, test, remove, and properly dispose of sediment deposits (in drainage channels and streams) which contain relatively high concentrations of pollutants.	•			•	
P7	Develop and implement a program which provides a means of recording the observations of field inspection and maintenance personnel, so this information can be used to help locate the source(s) of pollutants.	•			•	
P8	Determine the effectiveness of retrofitting existing stormwater retention basins to function as detection basins (to trap sediments from small storm events).			•	•	
P9	Determine the effectiveness of building, maintaining, and testing relatively large detention basins at several locations in the lower reaches of the watershed.			•	•	
P10	Determine the effectiveness of establishing, maintaining, and testing wetlands and riparian vegetation in retrofitted and/or new drainage channels.		•	•	•	
P11	Determine the effectiveness of building, establishing, and maintaining relatively large man-made wetland basins at several location in the lower reaches of the watershed.		•	•	•	
P12	Develop and implement an aggressive field program to search for, detect, and correct situations where rainfall and/or runoff presently contact potential contaminants.	•			•	
P13	Determine the effectiveness of retrofitting selected Sunnyvale storm sewers, sanitary sewers, and portions of the Sunnyvale POTW to allow the plant to receive and treat runoff from small storms and strategic portions of large storms.			•		
P14	Develop and implement intensifed street sweeping programs in strategic locations (e.g., central business districts, shopping malls, major parking lots, industrial areas) and/or at strategic times (e.g., following extended periods of dry weather).	•				
P15	Determine the effectiveness of retrofitting existing infiltration basins to accept and treat storm runoff.			•		
P16	Develop and implement bimonthly clean up days and corresponding curbside collection for trash and debris.	•				
P17	Provide, collect, and maintain more litter recepticles in strategic public areas and during major public events.	•				
P18	Provide generic plans, specifications, and demonstrate project results which will encourage architects, engineers, and building departments to implement systems which temporarily retain rainfall peaks on rooftops and/or in retention facilities to minimize the peak rate of discharge to the storm sewer systems or drainage channels.		•			
P19	Build, maintain, and assess the performance of several relatively small detention basins at selected locations in urbanized areas throughout the watershed. Begin by reviewing the operational histories of existing detention basins (e.g., Morgan Hill).		•	•		

* Community specific controls will be selected for implementation by individual communities on the basis of cost, benefit, and suitability. Not every measure will be implemented by every city.

Table 6-2C: Recommended Public Agency Control Measures

	POTENTIAL CONTROL MEASURES	Principal Functions			Geographic Applicability	
		Source Control	Hydraulic Control	Treatment Control	Area-Wide	Community* Specific
	PUBLIC AGENCY CONTROLS					
P20	Build, establish, maintain, and assess the performance of several relatively small man made wetlands basins at selected locations in urbanized areas throughout the watershed.		•	•		
P21	Develop and implement an aggressive field program to search for, detect, and control sanitary sewer leaks and areas where surcharging and/or overflows are most likely to occur.	•				
P22	Develop and implement programs to actively search for, identify, evalute, and prioritize erosion problems on undeveloped land, park land, and agricultural land.	•				
P23	Develop and implement programs to work with landowners, tenants, and/or public agencies to apply practical erosion control and sediment control practices.	•				
P24	Develop and implement practical progams for revegetating and otherwise restoring actively eroding areas (e.g., areas damaged by fires, overgrazing, landslides, improper tillage, and off road vehicle use).	•	•			
P25	Coordinate with the Soil Conservation Service and local resource conservation programs to support their activities to control erosion and sedimentation problems.	•				
P26	Cooperate with public transportation agencies, public agency motorpools, and public works departments to provide effective air pollution controls on publically owned vehicles and motorized equipment -- and/or to use alternative clean-burning fuel where practical.	•				
P27	Determine the effectiveness of using street flushers to reduce pollutants in runoff.	•				
P28	Determine the effectiveness of developing in-line infiltration facilities within selected reaches of large capacity drainage channels to accept and treat storm runoff.		•	•		
P29	Build, maintain, and assess the performance and potential impacts of several relatively small infiltration basins at selected locations in urbanized areas throughout the watershed.		•	•		

* Community specific controls will be selected for implementation by individual communities on the basis of cost, benefit, and suitability. Not every measure will be implemented by every city.